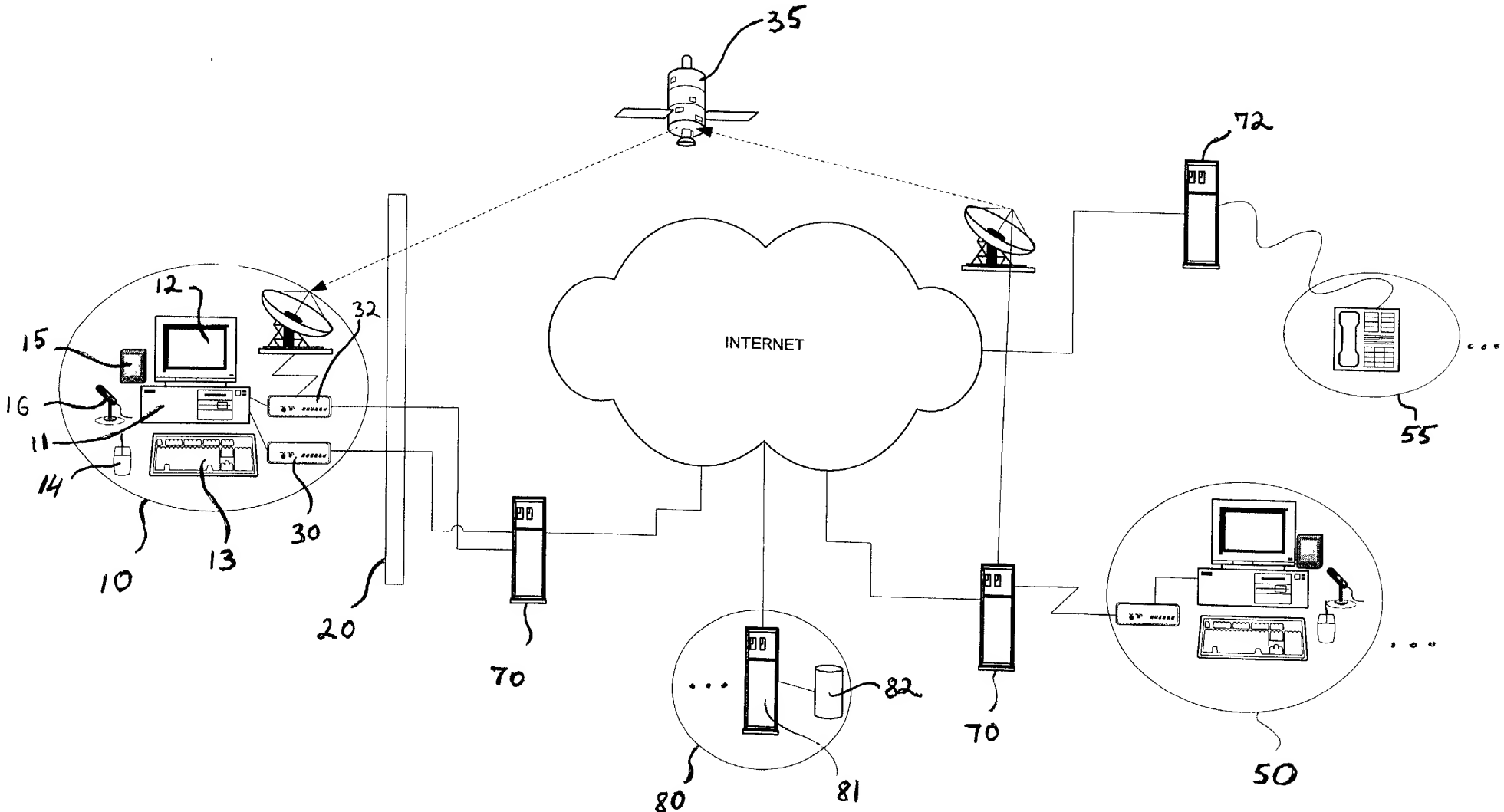

Fig. 1

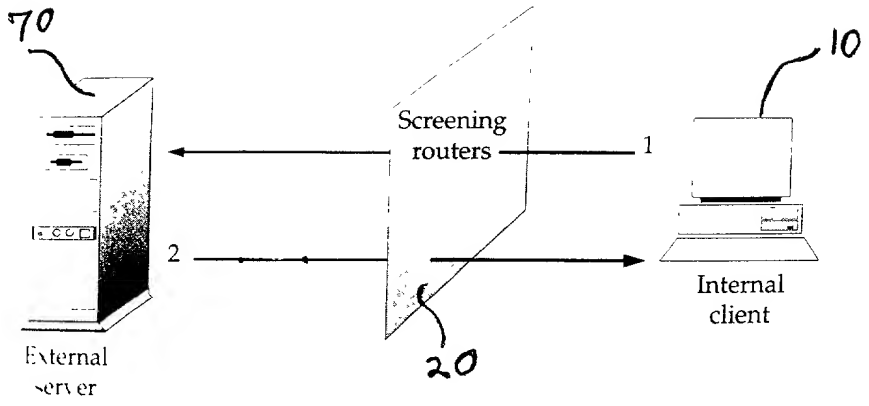
70
10
Screening
routers
1
2
Internal
client
20
External
server

Fig.2a

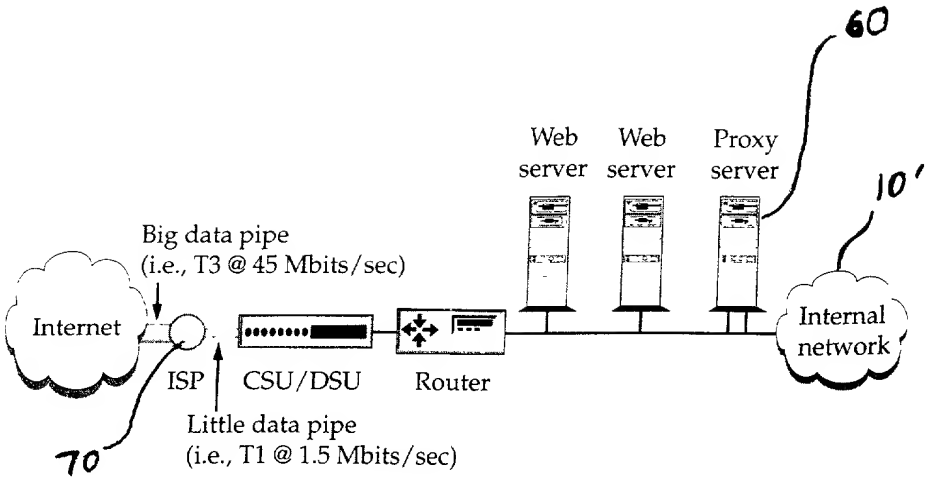
60
Web server
Web server
Proxy server
10'
Big data pipe
(i.e., T3 @ 45 Mbits/sec)
Internet
Internal network
ISP
CSU/DSU
Router
Little data pipe
(i.e., T1 @ 1.5 Mbits/sec)
70

Fig. 2b

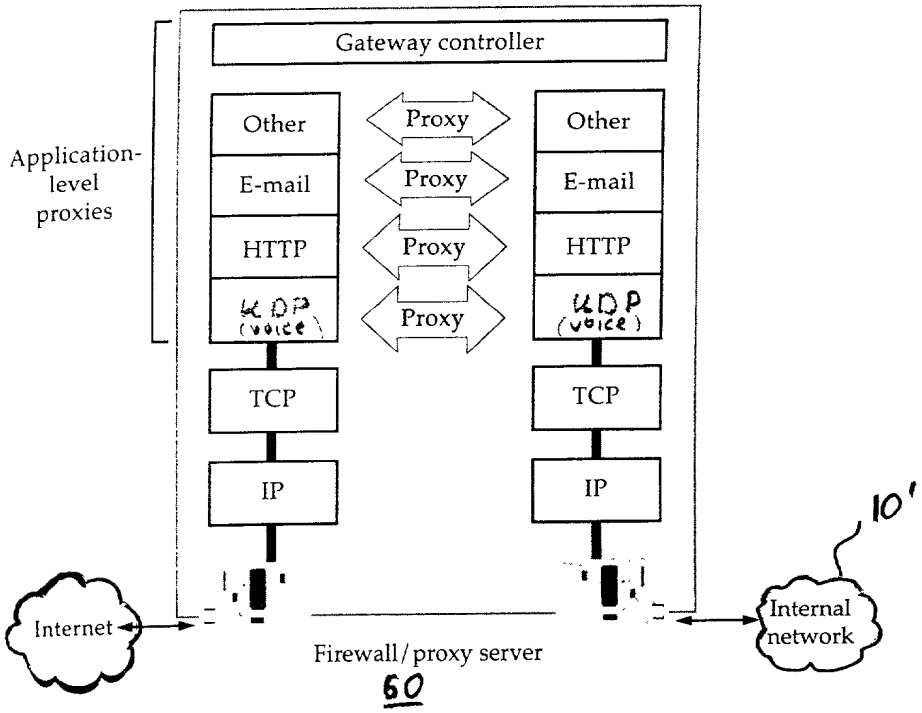
Gateway controller
Application-level proxies
Other
E-mail
HTTP
UDP (voice)
TCP
IP
Proxy
Proxy
Proxy
Proxy
Other
E-mail
HTTP
UDP (voice)
TCP
IP
10'
Internet
Internal network
Firewall/proxy server
60

Fig. 2c

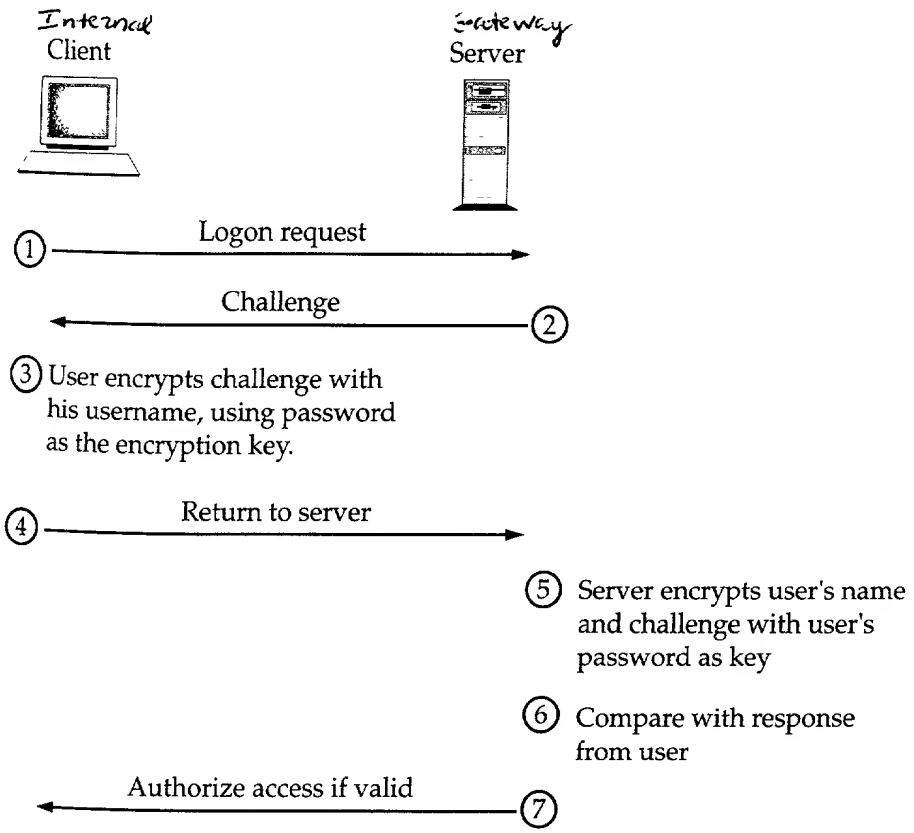
Internal
Client
Gateway
Server
1
Logon request
Challenge
2
3 User encrypts challenge with his username, using password as the encryption key.
4
Return to server
5 Server encrypts user's name and challenge with user's password as key
6 Compare with response from user
Authorize access if valid
7

Fig. 2d

PhoneFree registration page can be found at:
http://phonefree.com/install/addquickform2.html

Partial screen shot:

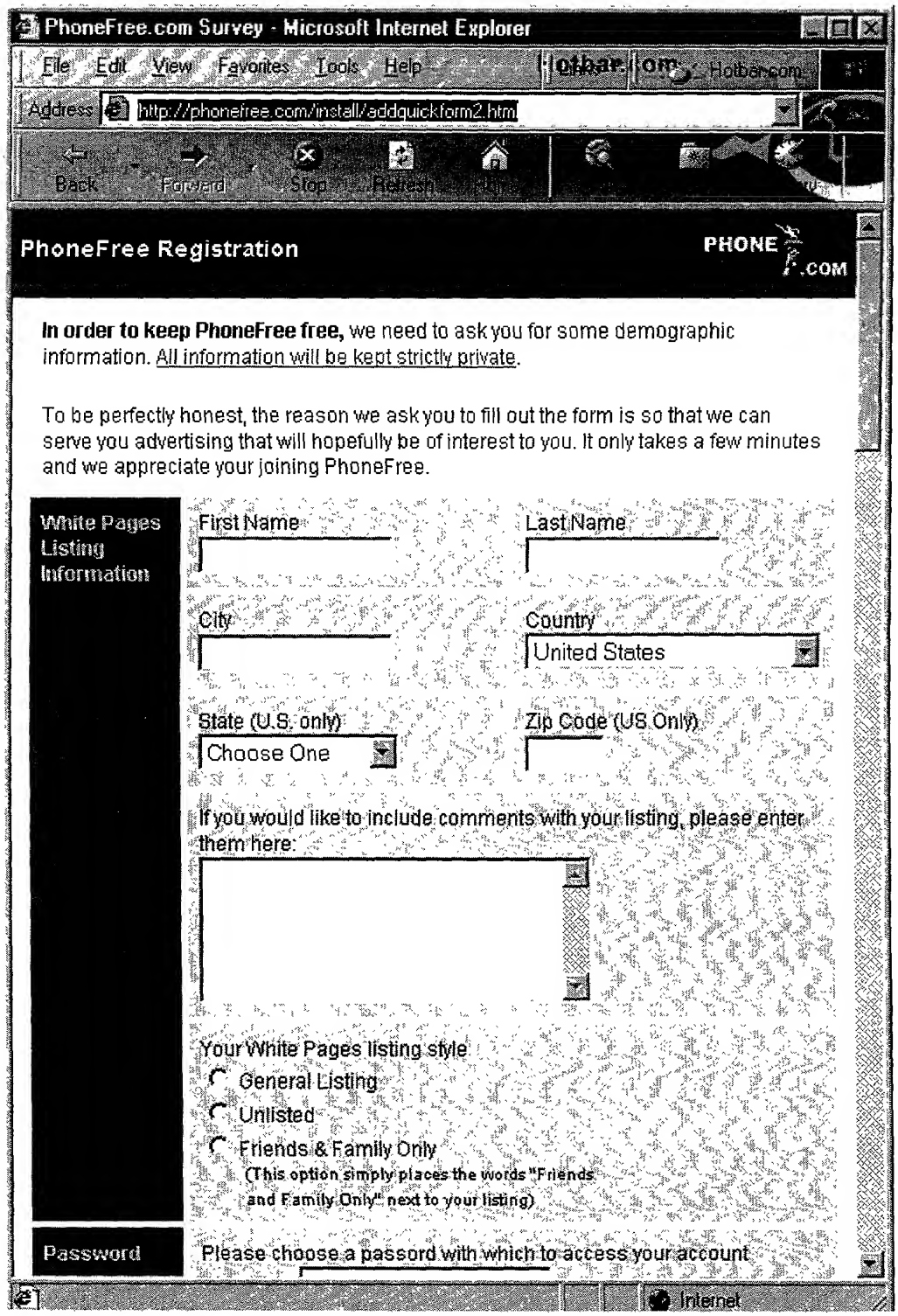

Fig. 3a

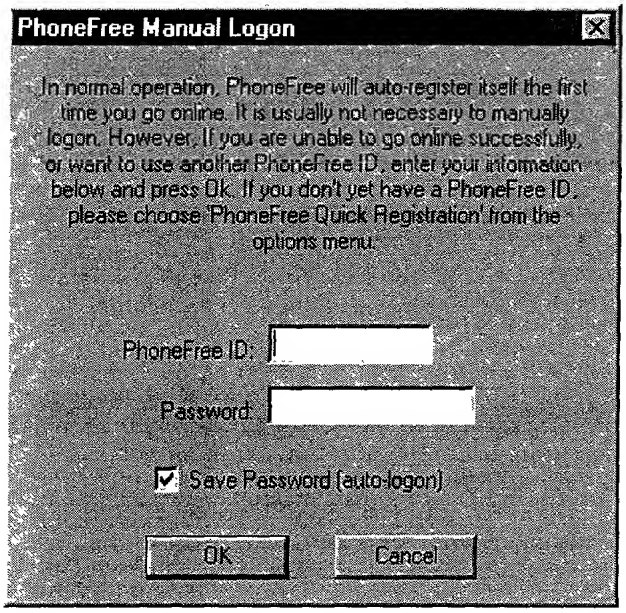
PhoneFree Manual Logon
In normal operation, PhoneFree will auto-register itself the first time you go online. It is usually not necessary to manually logon. However, if you are unable to go online successfully, or want to use another PhoneFree ID, enter your information below and press OK. If you don't yet have a PhoneFree ID, please choose 'PhoneFree Quick Registration' from the options menu.
PhoneFree ID:
Password:
Save Password (auto-logon)
OK
Cancel

Fig. 36

PCT/EP2003/050565

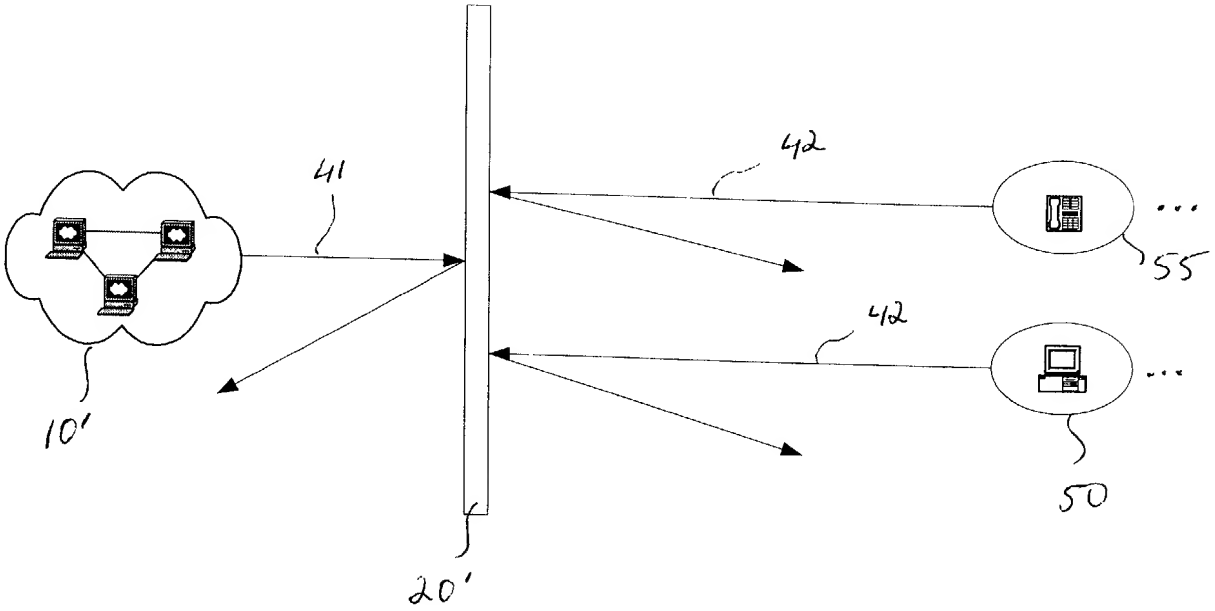

Fig. 4a

TRANSLATION PROVIDED BY DOCUMENT SERVICES

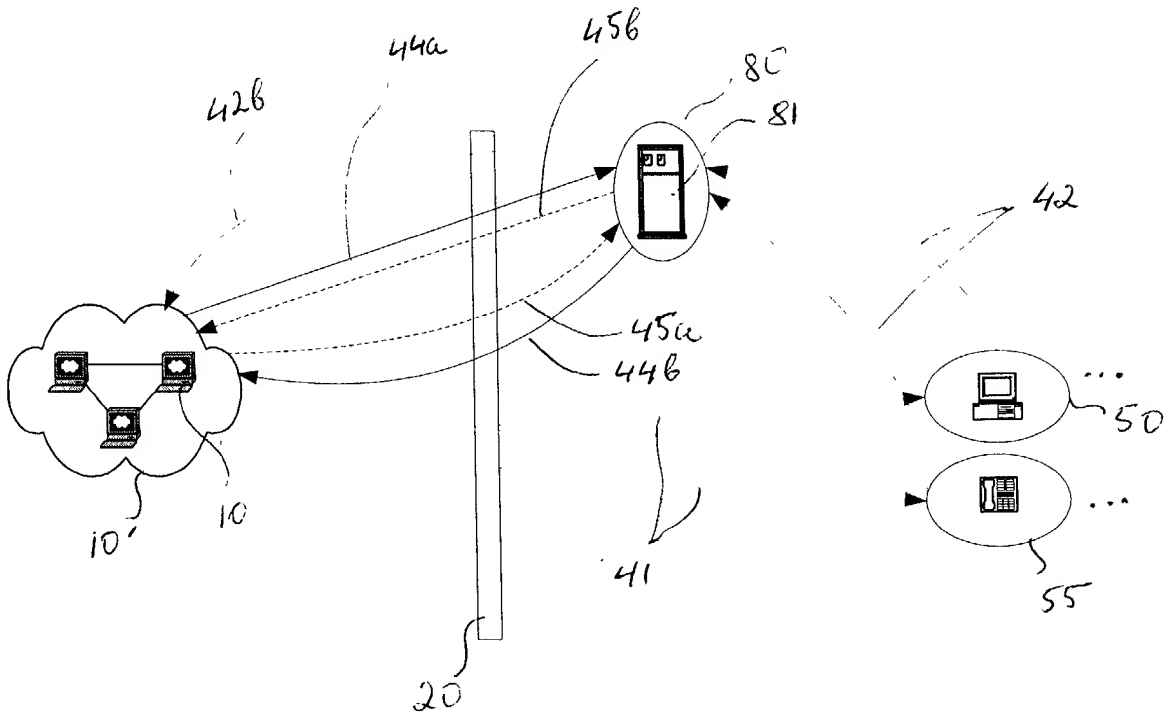

Fig. 4b

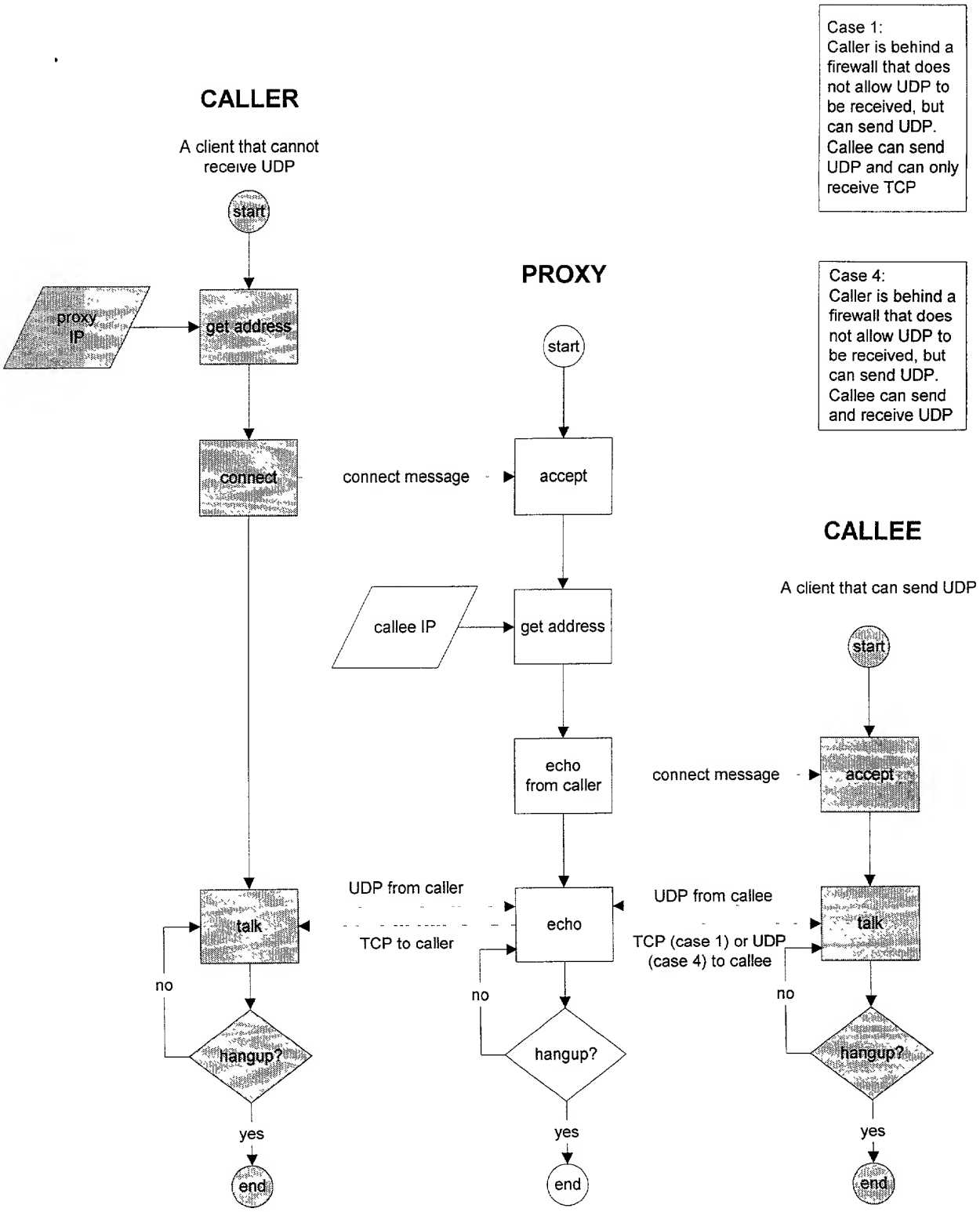
Case 1:
Caller is behind a firewall that does not allow UDP to be received, but can send UDP. Callee can send UDP and can only receive TCP
Case 4:
Caller is behind a firewall that does not allow UDP to be received, but can send UDP. Callee can send and receive UDP
CALLER
A client that cannot receive UDP
start
proxy IP
get address
connect
talk
no
hangup?
yes
end
PROXY
start
connect message
accept
callee IP
get address
echo from caller
UDP from caller
TCP to caller
echo
no
hangup?
yes
end
CALLEE
A client that can send UDP
start
connect message
accept
UDP from callee
TCP (case 1) or UDP (case 4) to callee
talk
no
hangup?
yes
end

FIG. 5

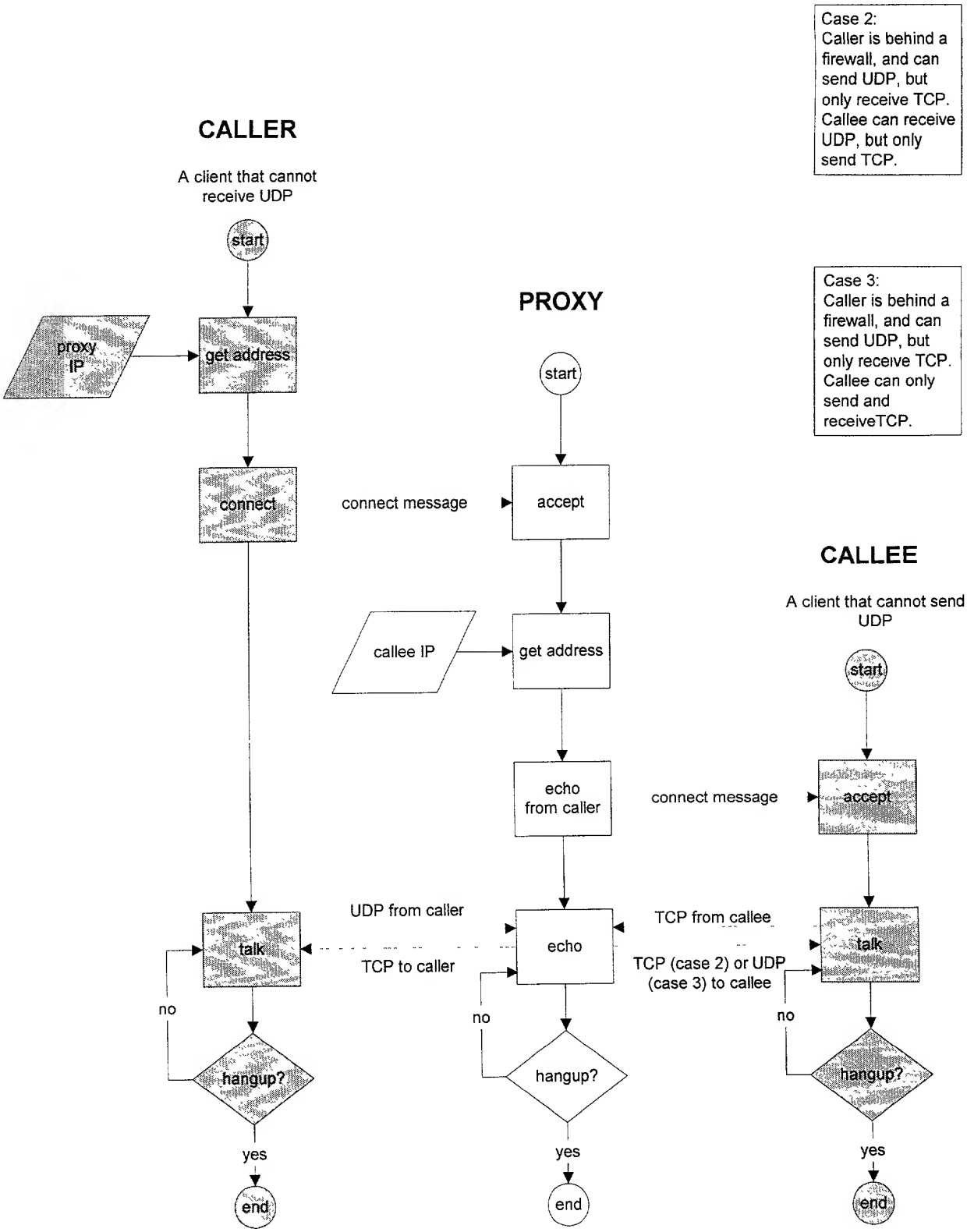
Case 2:
Caller is behind a firewall, and can send UDP, but only receive TCP. Callee can receive UDP, but only send TCP.
Case 3:
Caller is behind a firewall, and can send UDP, but only receive TCP. Callee can only send and receiveTCP.
CALLER
A client that cannot receive UDP
start
proxy IP
get address
connect
talk
no
hangup?
yes
end
PROXY
start
connect message
accept
callee IP
get address
echo from caller
UDP from caller
TCP to caller
echo
no
hangup?
yes
end
CALLEE
A client that cannot send UDP
start
connect message
accept
TCP from callee
TCP (case 2) or UDP (case 3) to callee
talk
no
hangup?
yes
end

FIG. 6

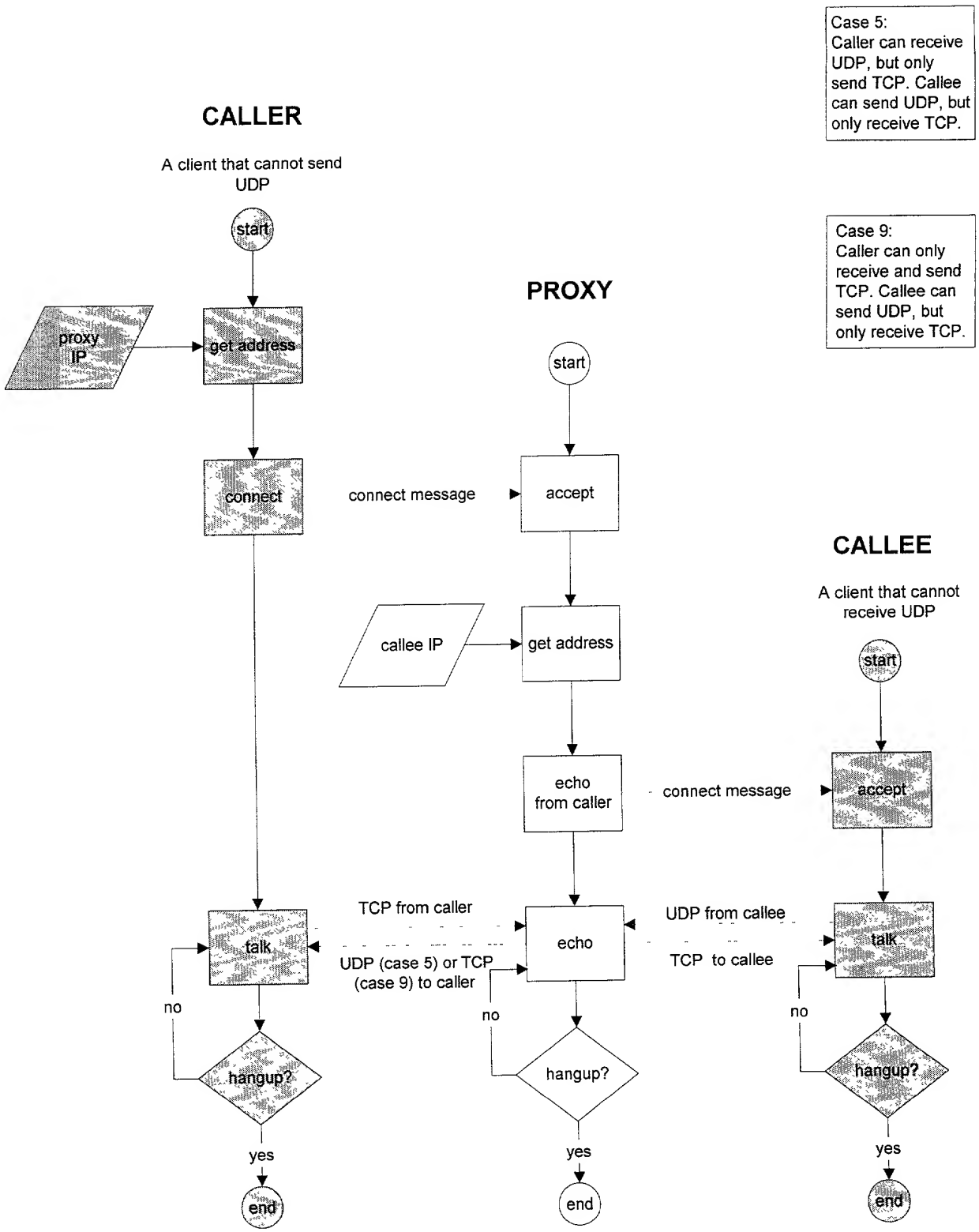
Case 5:
Caller can receive UDP, but only send TCP. Callee can send UDP, but only receive TCP.
Case 9:
Caller can only receive and send TCP. Callee can send UDP, but only receive TCP.
CALLER
A client that cannot send UDP
start
proxy IP
get address
connect
talk
no
hangup?
yes
end
PROXY
start
connect message
accept
callee IP
get address
echo from caller
TCP from caller
UDP (case 5) or TCP (case 9) to caller
echo
no
hangup?
yes
end
CALLEE
A client that cannot receive UDP
start
connect message
accept
UDP from callee
TCP to callee
talk
no
hangup?
yes
end

FIG. 7

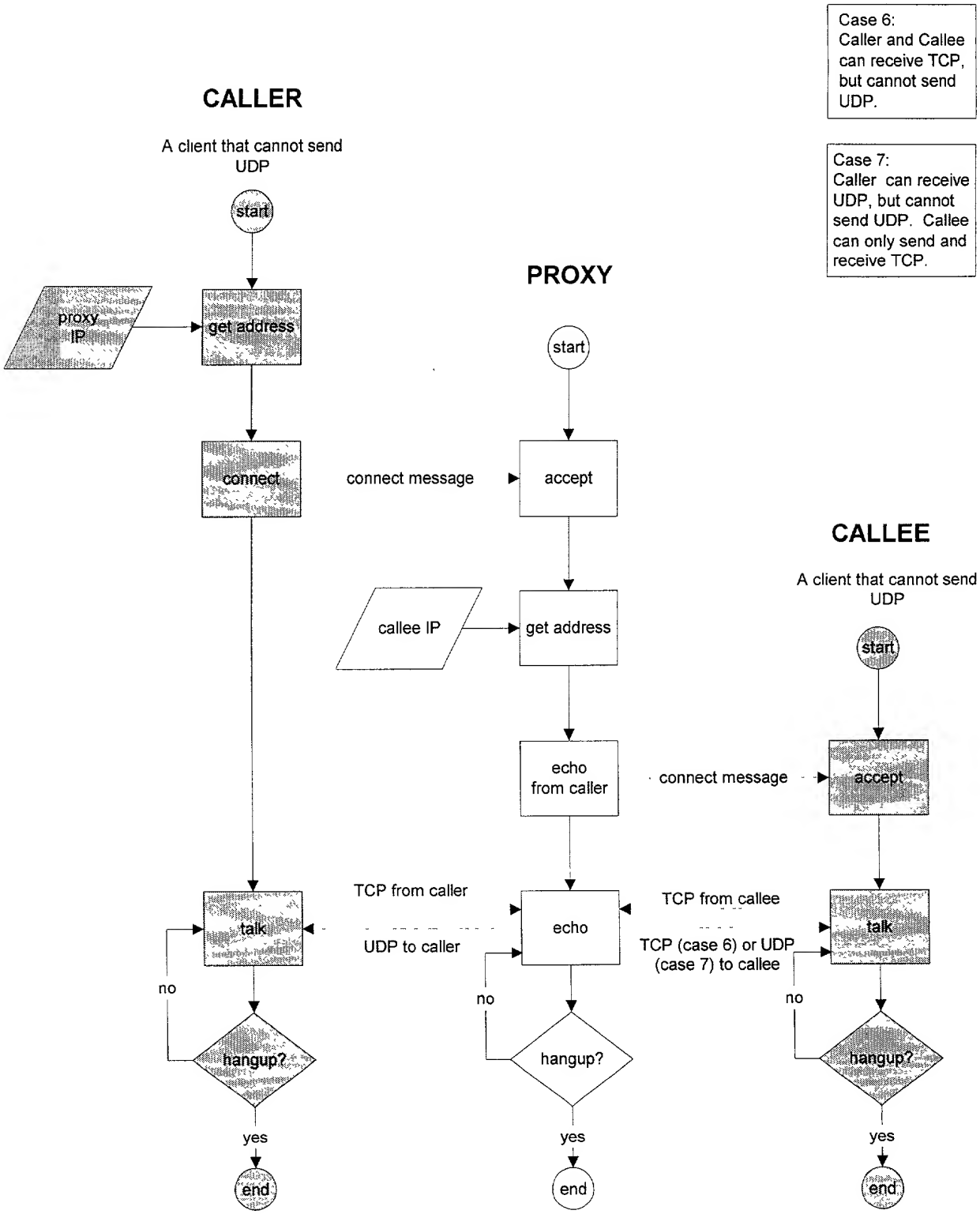
Case 6:
Caller and Callee can receive TCP, but cannot send UDP.
Case 7:
Caller can receive UDP, but cannot send UDP. Callee can only send and receive TCP.
CALLER
A client that cannot send UDP
start
proxy IP
get address
connect
talk
no
hangup?
yes
end
PROXY
start
connect message
accept
callee IP
get address
echo from caller
TCP from caller
UDP to caller
echo
no
hangup?
yes
end
CALLEE
A client that cannot send UDP
start
connect message
accept
TCP from callee
TCP (case 6) or UDP (case 7) to callee
talk
no
hangup?
yes
end

FIG. 8

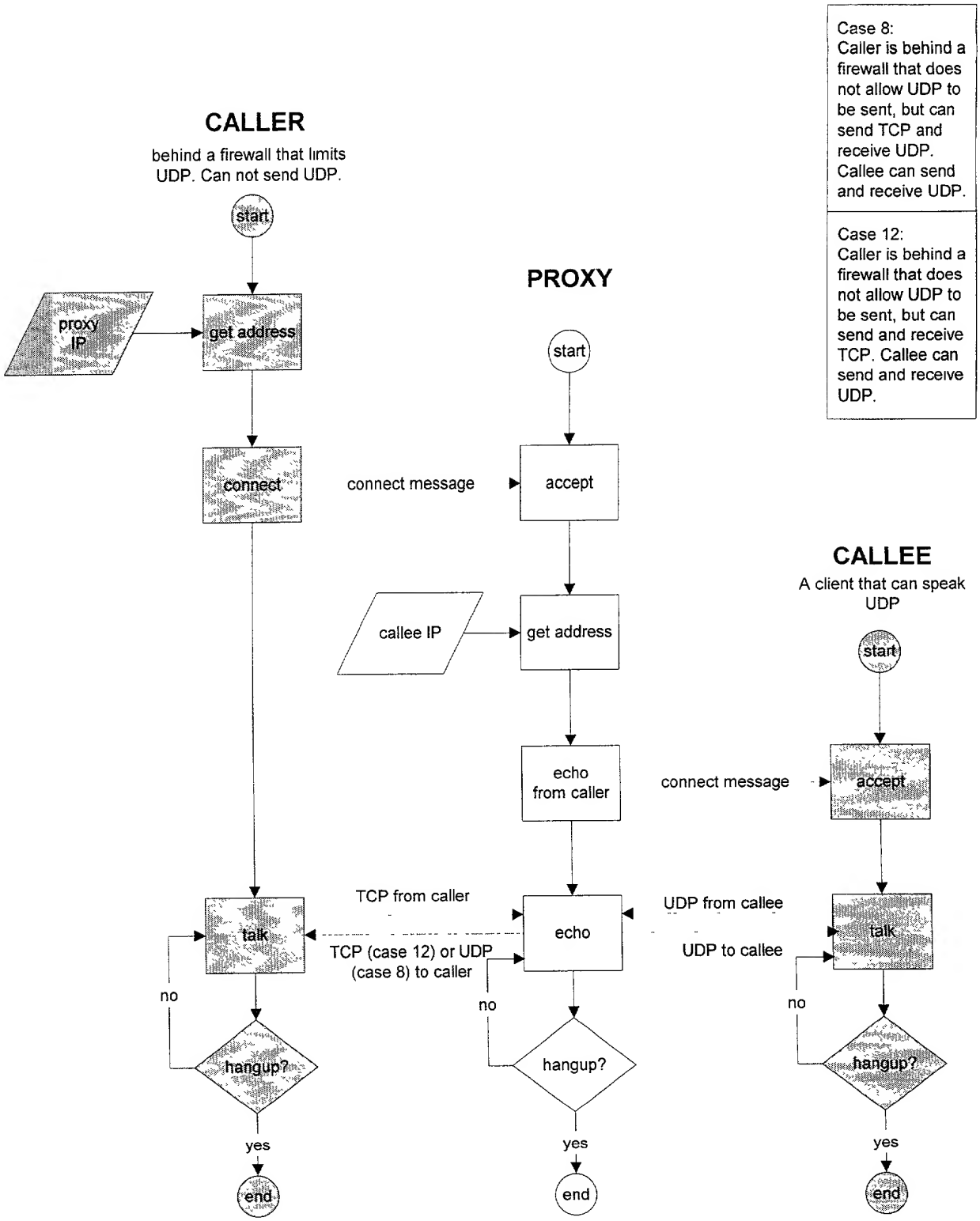
Case 8:
Caller is behind a firewall that does not allow UDP to be sent, but can send TCP and receive UDP. Callee can send and receive UDP.
Case 12:
Caller is behind a firewall that does not allow UDP to be sent, but can send and receive TCP. Callee can send and receive UDP.
CALLER
behind a firewall that limits UDP. Can not send UDP.
start
proxy IP
get address
connect
talk
no
hangup?
yes
end
PROXY
start
connect message
accept
callee IP
get address
echo from caller
TCP from caller
echo
TCP (case 12) or UDP (case 8) to caller
no
hangup?
yes
end
CALLEE
A client that can speak UDP
start
connect message
accept
UDP from callee
talk
UDP to callee
no
hangup?
yes
end

FIG. 9

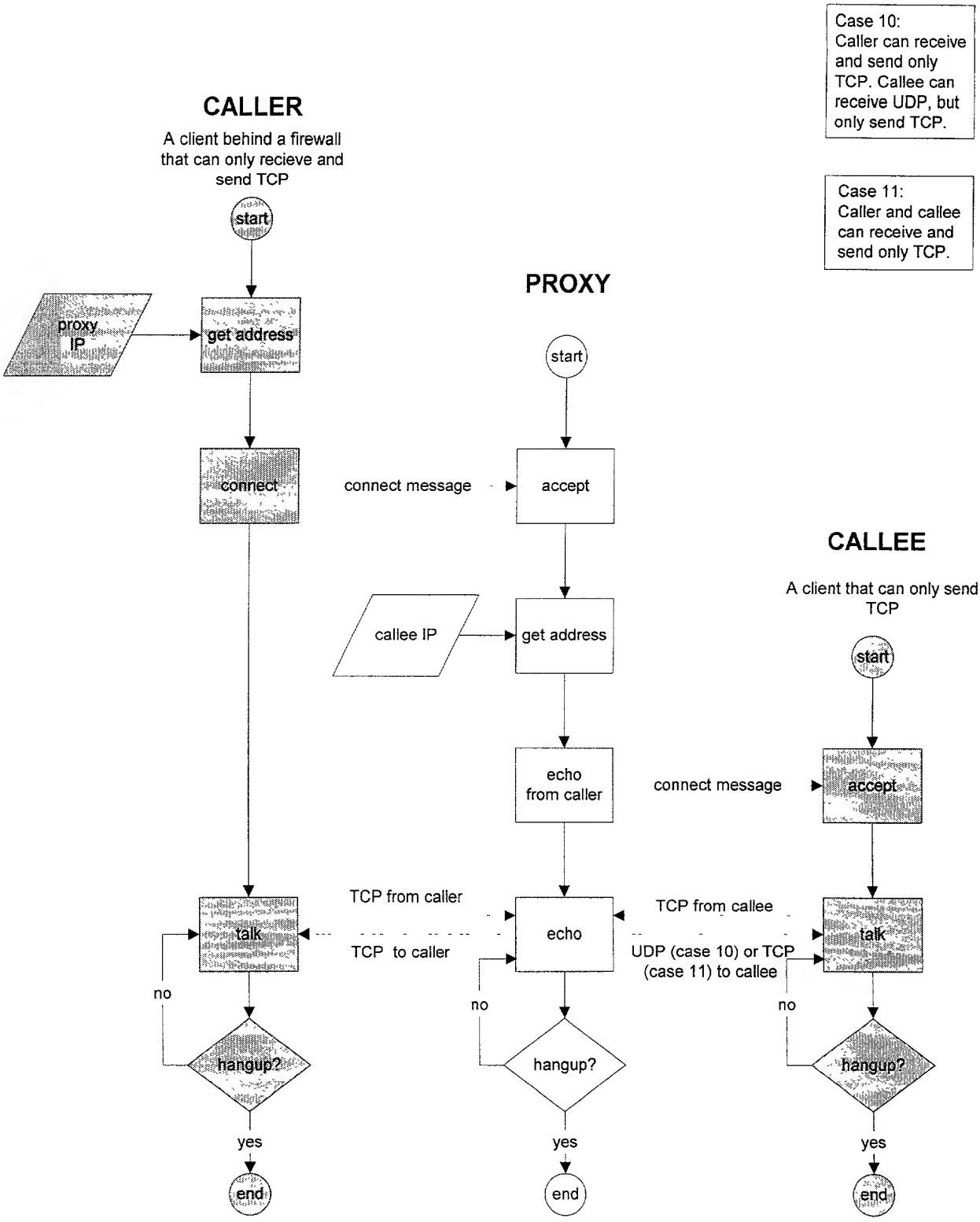
Case 10:
Caller can receive and send only TCP. Callee can receive UDP, but only send TCP.
Case 11:
Caller and callee can receive and send only TCP.
CALLER
A client behind a firewall that can only recieve and send TCP
start
proxy IP
get address
connect
talk
no
hangup?
yes
end
PROXY
start
connect message
accept
callee IP
get address
echo from caller
TCP from caller
TCP to caller
echo
no
hangup?
yes
end
CALLEE
A client that can only send TCP
start
connect message
accept
TCP from callee
UDP (case 10) or TCP (case 11) to callee
talk
no
hangup?
yes
end

FIG. 10

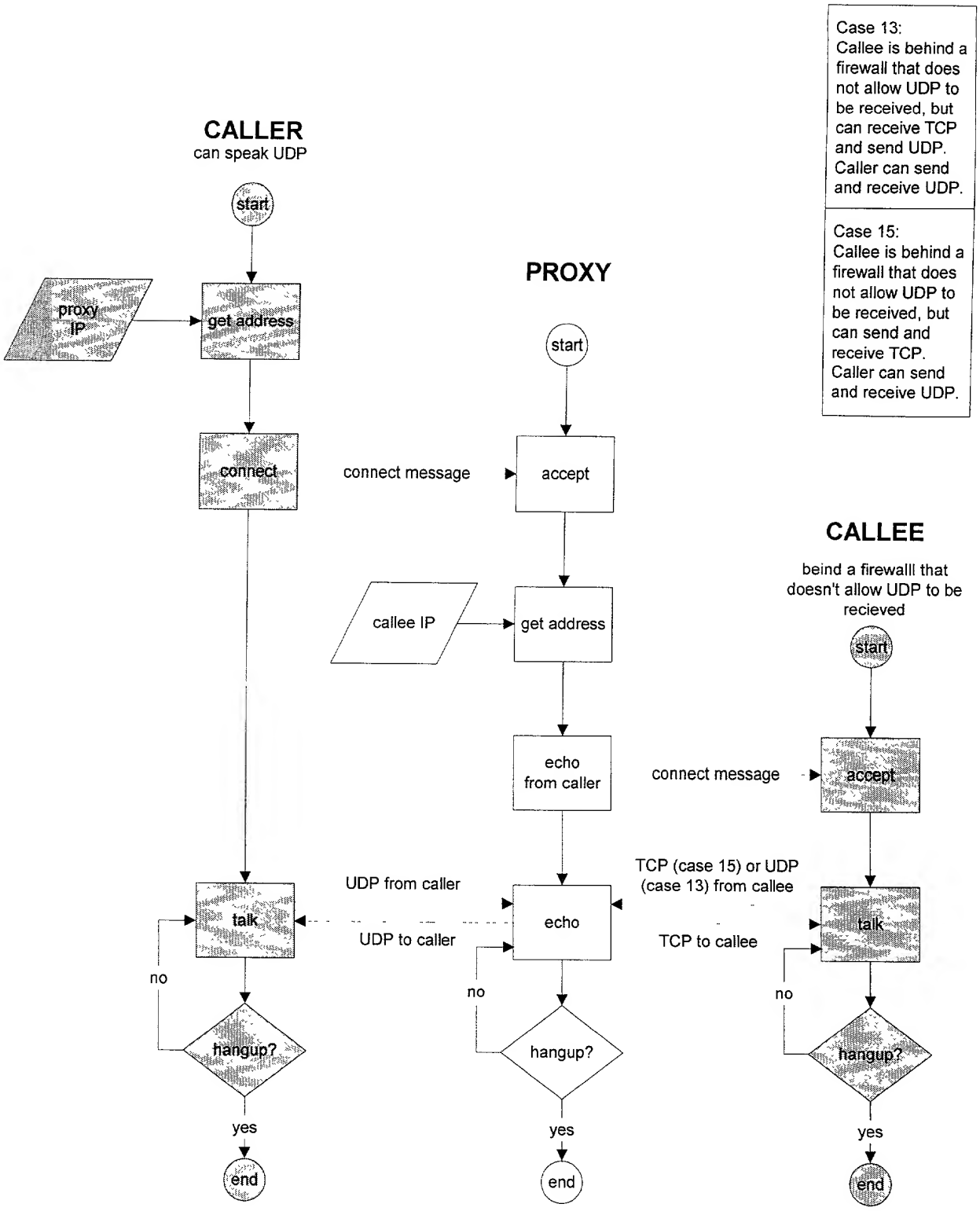
Case 13:
Callee is behind a firewall that does not allow UDP to be received, but can receive TCP and send UDP. Caller can send and receive UDP.
Case 15:
Callee is behind a firewall that does not allow UDP to be received, but can send and receive TCP. Caller can send and receive UDP.
CALLER
can speak UDP
start
proxy IP
get address
connect
talk
no
hangup?
yes
end
PROXY
start
connect message
accept
callee IP
get address
echo from caller
UDP from caller
UDP to caller
echo
no
hangup?
yes
end
CALLEE
beind a firewalll that doesn't allow UDP to be recieved
start
connect message
accept
TCP (case 15) or UDP (case 13) from callee
TCP to callee
talk
no
hangup?
yes
end

FIG. 11

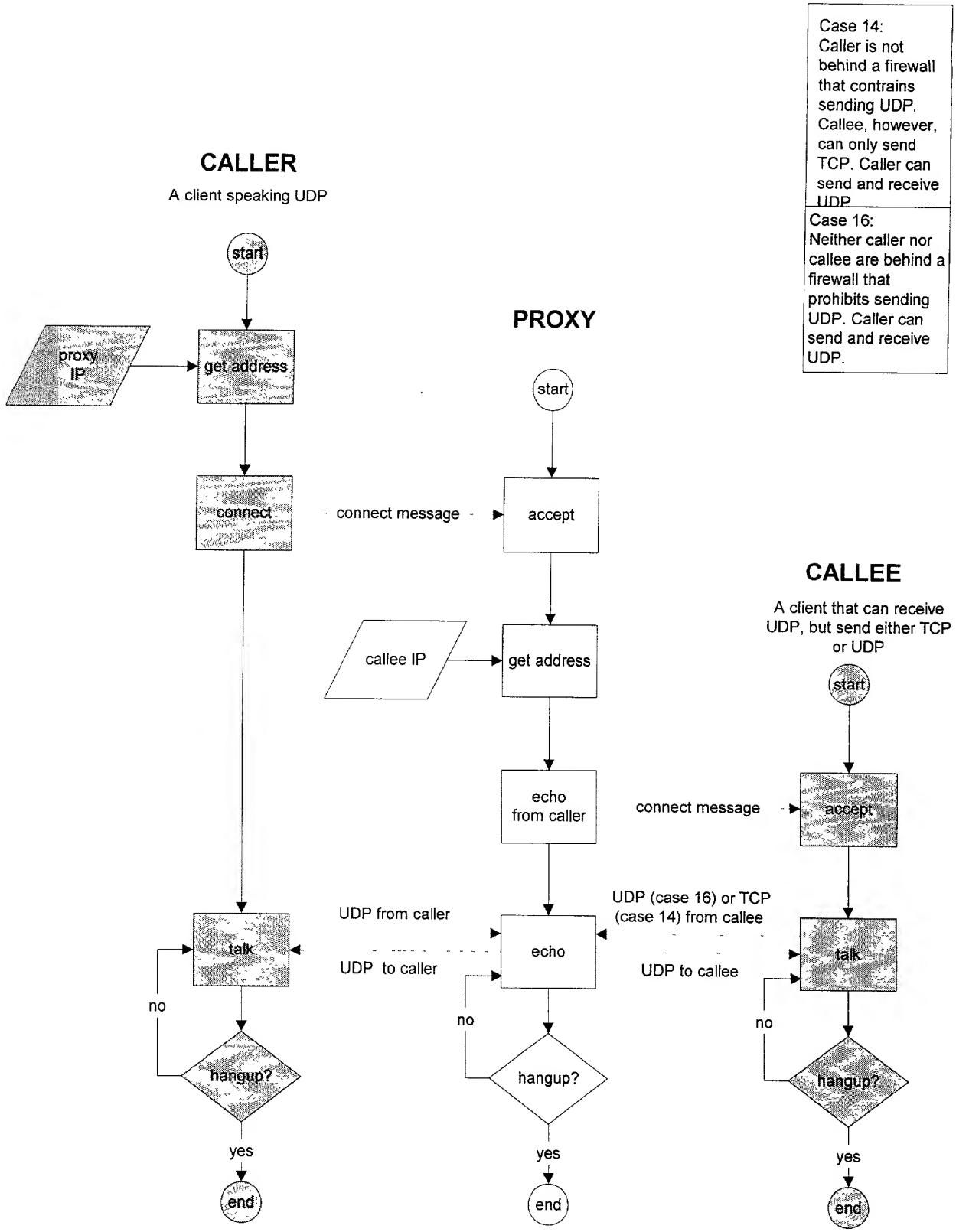
Case 14:
Caller is not behind a firewall that contrains sending UDP. Callee, however, can only send TCP. Caller can send and receive UDP.
Case 16:
Neither caller nor callee are behind a firewall that prohibits sending UDP. Caller can send and receive UDP.
CALLER
A client speaking UDP
start
proxy IP
get address
connect
talk
no
hangup?
yes
end
connect message
UDP from caller
UDP to caller
PROXY
start
accept
callee IP
get address
echo from caller
echo
no
hangup?
yes
end
CALLEE
A client that can receive UDP, but send either TCP or UDP
start
connect message
accept
UDP (case 16) or TCP (case 14) from callee
UDP to callee
talk
no
hangup?
yes
end

FIG. 12